The overall goal of this work is to develop catalytic systems that can be used in the synthesis of \( \alpha,\omega \)-difunctionalized monomers. Specific objectives include the synthesis and testing of three NHCs in a metal-based system. An alternative synthesis pathway was also used to develop a NHC-based palladium catalyst. Our goal is a NHC-based palladium catalyst. As shown in figure 3, imidazole synthesis uses primary amines, glyoxal and formaldehyde in refluxing methanol. The resulting imidazole \( \text{4} \) was purified by basifying to pH 9, washing with ether, removal of solvent and recrystallization with toluene. The tethered imidazole rings \( \text{5} \) were formed via \( \text{S}_\text{2} \) chemistry by refluxing \( \text{4} \) in \( \text{CH}_\text{3} \text{Br}_\text{2} \) (figure 4). An alternative synthesis pathway was also used — with limited success — by reacting \( \text{4} \) with \( \text{CH}_\text{2} \text{Br}_\text{2} \) in the presence of toluene. The product is purified via filtration of the precipitate and washing with toluene. Pd complexes are formed by refluxing \( \text{5} \) with Pd(OAc)\(_\text{2} \) in DMSO. Removal of the DMSO and washing the crude residue with water results in a light yellow powder. All structures were verified using H\(^1\) NMR.

During our summer research experience, we successfully synthesized three imidazole-based palladium catalysts using the processes explained above. Each was characterized and its identity verified using a combination of H\(^1\)-NMR and gas chromatography. The resulting Pd catalysts were tested, however preliminary results show little to no activity. This catalytic synthesis pathway will continue to be developed.

**References**


**Acknowledgements**

We would like to thank Iowa State University, the National Science Foundation and CBiRC for the opportunity to participate in this RET. In addition, we would like to extend a special “thank you” to Gina Roberts, Dr. Keith Woo and his lab group, Dr. Adah Leshem-Ackerman and the CBiRC staff.